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Abstract

THE MODELLING METHOD ON TRANSIENT THERMAL PROCESSES IN GAS-COOLED REACTORS ON THE ANALOGUE COMPUTERS

V.B. Nesterenko and V.M. Shadsky
Heat and Mass Transfer Institute of the BSSR Academy of Sciences

The analogue computers are used more often for the transient investigation with power change, heating, starting-up and reactor shut-down cooling. The use of these computers deteriorated as the transient heat transfer in reactor is described by partial differential equations.

Digital computers permit partial equations to be solved. The difficulty of direct connections of these computers with the real control system elements as well as complicated and laborious programming and programme arrangement is a considerable obstacle to their application for engineering calculations.

The preparation of equation solution being simple, it is not difficult for the analogue computers to connect with the real elements of control systems.

However serial analogue computers (MN-7, EMU-8, EMU-10, MN-8, MN-10, MN-14, MN-6) are designed to solve usual differential equations. Therefore the method for transformation of partial equations into ordinary non-linear differential equations is necessary.

This work offers an effective and simple transformation method of partial equations into ordinary differential ones which take into account parameters distributions along the reactor length by the presentation of the average-integral on the length gas temperature in terms of inlet and outlet temperatures and their derivatives in the form of a series.

The method is checked up at deep separate and simultaneous discontinuous and sinusoidal disturbances over the gas-flow-rate reactor neutron power and inlet gas temperature.

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Two terms of above series provide good accuracy of the solution (error is not more than 3-4 per cent).

The method proposed is compared with finite difference method, taken as a reference one and it is shown that this method is more economic than the finite difference one (the reactor is described by 5 differential equations rather than by 8 using the finite difference method).

The method may be effectively used for the dynamic characteristic study of a reactor, refrigerator and other heat exchangers of nuclear power plants.

This method may be used for the dynamic characteristic study of a gas-cooled reactor with energy change, heating-up, starting-up and reactor shut-down cooling.